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ABSTRACT

A multivariate model to explain student success and failure at the Open University of the United Kingdom is outlined. The model is based on the results of an evaluation study that explored the suitability of this teaching system for young people under 21 years old. Twenty-three characteristics were designated as social and psychological problems, and it was hypothesized that the more problems students had, the less likely they would be to gain a credit. Younger students were assigned scores ranging from zero to 23 depending upon the number of problems they exhibited. It was found that educationally qualified students with low scores were particularly successful and unqualified students with high scores were very unlikely to gain a credit. In order to attach weights to individual problems, a stepwise multiple regression was conducted using the 23 problems as independent variables and whether or not a credit was gained as the dependent variable. The resulting variables was an extremely good predictor for first-year progress among younger students. When performance across the age range was examined, it was found that younger students with few social and psychological problems fared as well as their older counterparts and that the relatively poor progress made by younger students could partly be explained by the fact that their study environments and personality characteristics tended to be less suited to distance study. However, it was also shown that when numerous problems existed it was the older students who were more willing or able to overcome them. It is concluded that environmental and psychological factors are at least as important as academic ability in determining student performance, and that the model can be used to identify high-risk students. A bibliography is appended. (SW)

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EXPLAINING STUDENT SUCCESS AND FAILURE IN A DISTANCE TEACHING SYSTEM - A MULTI-VARIATE APPROACH

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This paper was presented at the Twenty-First Annual Forum of the Association for Institutional Research held at the Leamington Hotel in Minneapolis, Minnesota, May 17-20, 1981. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

Mary Corcoran
University of Minnesota
(Editor, AIR Forum Publications)

ABSTRACT

The paper outlines a multi-variate model for the explanation of student success and failure at the Open University of the United Kingdom. It is based on the results of an evaluation study into the suitability of this teaching system for young people aged under twenty-one. It is shown that environmental and psychological factors are at least as important as academic ability in determining student performance. The model can be used to identify high-risk students and also to suggests ways in which the teaching system could be improved.

Introduction

The Open University (OU) of the United Kingdom is a multi-media distance teaching system offering degree-level opportunities to adults studying in their own home.[1] Between 1974 and 1976 over a thousand students aged between eighteen and twenty were admitted to the University in order to determine whether the system is suitable for students in this younger age group. Woodley and McIntosh (1980) showed that the younger students were much less likely to succeed with their first year studies than were their older counterparts. In order to discover which types of younger student were most likely to succeed with their studies their first year progress was analysed in some detail.

There now exists a considerable body of research into the prediction of success and failure in higher education and several detailed reviews are available (Miller (1970), Watts (1972), Astin (1975), Entwistle and Wilson (1977)). Literally hundreds of predictive variables have been considered, the great majority falling under one of the following headings: measures of intellectual ability, personality characteristics, demographic variables, motivation and study habits/learning styles. However, in a distance teaching situation there are also a whole host of different variables which can influence student progress. These include employment and domestic factors, and access to the teaching media. This paper represents an attempt to combine these variables to produce a multi-variate explanatory model of younger students progress at the OU.

Early results

In Figure 1 we show the progress made by younger students in their first year, broken down by previous educational qualifications and sex. We see that, in general, the higher the qualifications held the more likely they

were to obtain a course credit. However, except in the case of those with no qualifications at all, women fared better than men at each educational level.

The obvious conclusion to draw from Figure 1 would be that OU progress is determined by academic ability. However, while acknowledging that ability is almost certainly a significant factor, we would contend that such a conclusion is too simplistic for a number of reasons. Firstly, an earlier survey had shown that the educational qualifications held by younger students did not necessarily reflect their true ability due to fortuitous events in their schooling. Secondly, factors in their study environment suggested that those with low qualifications would find OU study more difficult regardless of their ability. Thirdly, the fact that women fared better than men regardless of qualifications, and that many eminently well qualified younger students nevertheless failed to make progress, demonstrates clearly that ability alone cannot explain the variability in younger student performance.

Further analysis of the performance of younger students was carried out using data from administrative forms, a sociological questionnaire and a psychometric test battery which they had completed as they began their OU studies. This analysis enabled us to identify a large number of variables which were good predictors of whether or not a younger student would gain a course credit. However, no single variable could explain why, for instance men without the qualifications for entry to a conventional British university fared so badly in comparison with "qualified" women.[2] Academic ability, as measured by the AH6 intelligence test and the vocabulary test, was obviously important but clearly other factors were also at work.

Towards a multi-variate model

To begin with we took twenty-three characteristics which we refer to as social and psychological "problems". Some of these characteristics such as high artistic ability would be regarded as positive attributes in other contexts but we have selected them and labelled them as "problems" because from the analysis referred to above they appeared to be associated with failure to gain a credit. In Table 1 we have listed these characteristics and ranked the sex and qualifications categories according to their possession of a given characteristic. For instance, the first row indicates that "unqualified" men contained the highest proportion of manual workers and "qualified" women the lowest. It emerges from the totals given at the bottom of this table that "unqualified" students were "disadvantaged" in many other ways apart from their somewhat lower ability levels. To develop an adequate explanatory model we must therefore adopt a multi-variate approach.

Our simple hypothesis was that the more "problems" students had, the less likely they would be to gain a credit. Younger students were therefore given scores ranging from zero to twenty-three depending upon the number of "problems" they exhibited. This new variable proved to be a powerful predictor of student progress. Eleven of the sixteen students with fewer than four problems were successful but only two of the fifteen with more than twelve problems. In Table 2 we have used a grouped version of this score as a new test factor.[3]

The new variable produced significant relationships in each of the sex and qualifications categories. "Qualified" students with low scores were particularly successful and "unqualified" students with high scores were very unlikely to gain a credit. The adjusted pass-rates show that much of

the variability in pass-rates can be accounted for by the fact that groups such as the "unqualified" tended to have more "problems".[4]

Up until now we have treated problems as if they were all equal in importance whereas some are likely to be more critical than others. In order to attach weights to individual problems we ran a step-wise multiple regression using the twenty-three problems as independent variables and whether or not a credit was gained as the dependent variable. The 'B' coefficients from the resulting equation were then used to produce a weighted problem score for each student. (The actual weights are shown in Figure 2.)

The new variable proved to be an extremely good predictor of first-year progress among younger students. As shown in Table 3, six out of ten younger students with a "weighted problem score" of fifty or less gained a credit but only one out of ten of those with a score of more than fifty. Furthermore this pattern was repeated in each of the sex and qualifications categories and the adjusted pass-rates show that this model can explain a great deal of variability in success rates between the different categories.

In the next stage of our analysis we wished to examine whether those factors which had been found to be important in explaining younger student performance could also account for the variation in pass-rates between the different age-groups. In Table 4 we revert to the unweighted total problem score and compare pass-rates across the age range.

Within each age group those students with the most problems were the least likely to gain a credit. Among those with fewer than six problems the

younger students were as successful as students aged between twenty-one and forty. However, among those with six or more problems, and particularly in the case of those with nine or more problems the younger students fared worse than their older counterparts. Students aged between forty-one and fifty fared better than younger students regardless of the number of problems. The adjusted pass-rates indicate that the younger students' relatively poor performance can partly be explained by the fact that they tended to have more problems. However, the figures would suggest that, in the main, the younger students were less successful because those with multiple problems were less able or willing to overcome them or to adopt appropriate coping strategies.

Conclusions

In this paper we have shown that previous educational qualifications were a good predictor of first-year performance among younger students. The lower the qualifications the less chance a student had of gaining a credit. However, this was only partly due to the fact that those with low qualifications were less academically able. Progress at the OU was also related to factors in the study environment such as ease of access to study centres, the attitudes of friends, work colleagues and employers, the amount of preparatory study etc. and to certain personality characteristics. Younger students with low qualifications fared less well because they were "disadvantaged" not only in terms of academic ability but also in terms of their study environment and in terms of their personality characteristics which made them less suited to OU study.

The multi-variate model could be used to develop tools to identify "high" and "low risk" younger students at the admissions stage. However, this

would involve the completion and interpretation of special questionnaires and tests and therefore the strengths of such models perhaps lie in the contribution they make to our understanding of the reasons for the success or failure of younger OU students.

When we looked at performance across the age range it was shown that younger students with few social and psychological "problems" fared as well as their older counterparts and that the relatively poor progress made by younger students could partly be explained by the fact that their study environments and personality characteristics tended to be less suited to distance study. However, it was also shown that when numerous problems existed it was the older students who were more willing or able to overcome them.

Footnotes

1. For a more detailed description of the Open University's teaching system, please consult the current edition of the following OU publications: The Guide for Applicants, The BA Degree Handbook, The Courses Handbook.

2. Students were regarded as "qualified" if they held two or more A levels, an Ordinary National Certificate or Diploma (ONC/D) or if they had previously entered Higher Education.

3. When grouping "problem scores" we tried to preserve what appeared to be naturally occurring break-points in the data and also to ensure that there were reasonable numbers of students within each group.

4. Adjusted pass rates were calculated to control for the effects of a given variable being differently distributed between the categories of student under consideration. The distribution of the variable was held constant at the level found among the most successful student category. For a more detailed account refer to Woodley and McIntosh (1980).

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Table 1

Rank-ordering of predictive variables within sex and qualifications categories

	Male		Female	
	Qual-ified	Unqual-ified	Qual-ified	Unqual-ified
Predictive variables				
a) Social 'problems'				
1 In manual occupation	2	1	4	3
2 Not married	1	2	4	3
3 Not possessing 1 A-level or equivalent	3=	1	3=	2
4 Not definitely aiming for OU degree	4	1	3	2
5 Quiet place for study not always available	4	3	2	1
6 Problems of access to broadcasts	3	1	4	2
7 Study centre attendance problems	3	2	4	1
8 Summer school attendance problems	4	3	2	1
9 Work colleagues non-supportive	2	1	4	3
10 Employer non-supportive	4	2	3	1
11 Friends non-supportive	1	4	2	3
12 Financial problems	4	3	2	1
13 Insufficient preparatory work	4	1	3	2
b) Psychological 'problems'				
14 Low AH6 score	3	2	4	1
15 Low Vocabulary score	3	1	4	2
16 High Neuroticism score	3	4	2	1
17 Low academic ability (self-rated)	4	2	3	1
18 High artistic ability (self-rated)	4	2	3	1
19 High impulsiveness (self-rated)	4	2	3	1
20 High leadership ability (self-rated)	2	1	3	4
21 High mechanical ability (self-rated)	2	1	4	3
22 High popularity (self-rated)	4	1	3	2
23 High self-confidence (social) (self-rated)	4	3	2	1
Numbers of 1's and 2's	6	17	6	17

Table 2

The percentage of younger students gaining a credit analysed by number of social and psychological 'problems'

	All	Qualified	Unqualified	Male	Female	Male		Female	
						Qualified	Unqualified	Qualified	Unqualified
Number of social and psychological 'problems'									
0 - 5	67	78	41*	62*	72*	76*	34*	79	49*
6 - 8	47	37	58	48	46	33	61	41	53*
9 or more	15	46*	12	12	20	47*	9	46*	15
Significance level of Chi-square	1%	1%	1%	1%	1%	5%	1%	5%	1%
Actual pass-rate		52	29	35	41	49	28	55	30
Adjusted pass-rate		52	47	37	41	50	45	55	46

* Percentage based on less than 25 subjects

Table 3

The percentage of younger students gaining a credit analysed by weighted social and psychological 'problems'

	All	Qualified	Unqualified	Male	Female	Male		Female	
						Qualified	Unqualified	Qualified	Unqualified
Weighted problem score									
0 - 50	60	63	56	58	62	60	56	66	56*
51 and over	12	17*	11	10	15	15*	9	19*	13
Significance level of Chi-square	1%	1%		1%	1%	5%	1%	5%	1%
Actual pass-rate		52	29	35	41	49	28	55	30
Adjusted pass-rate		52	45	37	41	50	45	55	46

* Percentage based on less than 25 subjects

Table 4

The percentage of students in different age groups who gained a credit analysed by number of social and psychological 'problems'

	Age group				
	Under 21	21-25	26-30	31-40	41-50
Number of social and psychological 'problems'					
0 - 5	67	68	64	64	79
6 - 8	47	54	68	70	64
9 or more	15	38	48	42	42
Significance level of Chi-square	1%	5%	Not Sig.	1%	5%
Actual pass-rate	38	53	62	61	61
Adjusted pass-rate	47	56	62	61	64

Figure 1 The percentage of younger students gaining a credit in the first year analysed by educational qualifications and sex (1974-1976 intakes)

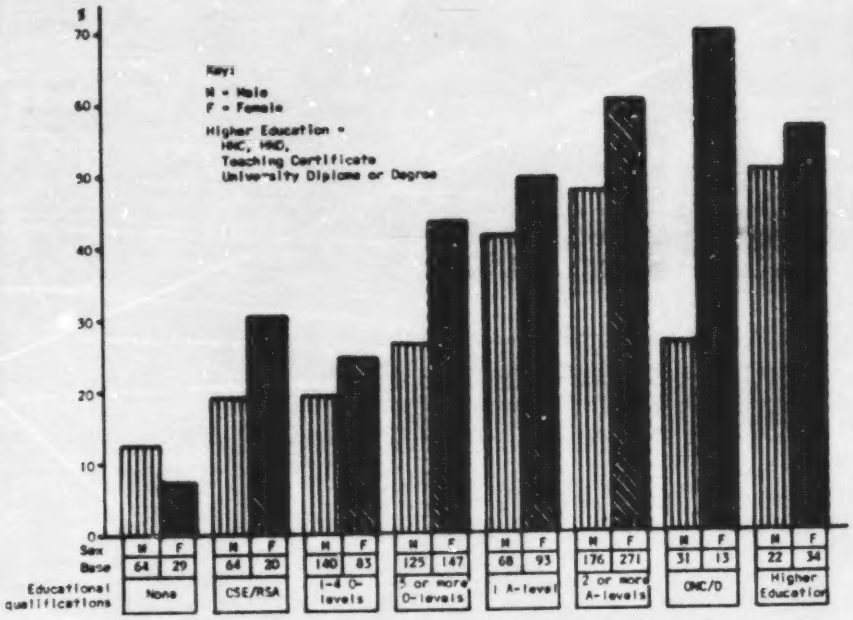

Figure 2 Weights used to derive weighted problem score

Variable	Weight	Variable	Weight
Friends non-supportive	25	Not married	6
High popularity (self-rated)	15	In manual occupation	6
Summer school attendance problems	14	Study centre attendance problems	5
High artistic ability (self-rated)	14	High self-confidence (social) (self-rated)	4
Less than one A-level	13	Insufficient preparatory work	2
Quiet place for study not always available	10	Low vocabulary score	2
Low AH6 score	9	High leadership ability (self-rated)	2
Employer non-supportive	8	Not definitely aiming for OU degree	1
High mechanical ability (self-rated)	7	Work colleagues non-supportive	-1
Low academic ability (self-rated)	6	Financial problems	-1
High impulsiveness (self-rated)	6		